



## MEMORANDUM

TO: Al Hanscom, BETA Group, Inc. DATE: May 9, 2005  
FROM: Cyndee Fuller, ESS Group, Inc.  
SUBJECT: Revision of Risk-based Air Concentrations for PCBs and comparison with MADEP air guidance. PROJECT NO.: B345-000  
COPY TO: Dave Billo, BETA Group, Inc.

This memorandum contains revised risk-based air concentrations (RBACs) for PCBs provided to you in a memo dated May 2, 2005 and replaces those previously calculated values. The revised RBACs presented herein consider non-carcinogenic health effects in addition to carcinogenic health effects and apply the unit risk value of  $0.1 \text{ [(mg/m}^3\text{)}^{-1}]$  rather than  $2 \text{ [(mg/m}^3\text{)}^{-1}]$  (which was incorrect). This memo also compares the results with MADEP threshold effects exposure limits (TELs), allowable ambient limits (AALs), and allowable threshold concentrations (ATCs).

RBACs are based on an occupational exposure within the school (8 hours per day, 250 days per year, for 25 years). This represents exposure of an adult worker, who is likely to experience the longest exposure in the school. On a cubic meter per kilogram body weight basis, the intake of students is similar to the intake of adults, but students will typically only be exposed for three years.<sup>1</sup> The first RBAC is an action level set at the lower concentration associated with an excess lifetime cancer risk (ELCR) of  $1 \times 10^{-6}$  or a non-carcinogenic hazard index (HI) of 0.2. This value is intended to be used as a cautionary value to identify the need for more frequent sampling. The second RBAC is the maximum acceptable air concentration that should not be exceeded for any extended time period, set at the lower concentration associated with an ELCR of  $1 \times 10^{-5}$  or a non-carcinogenic HI of 1.0. The values are calculated in Attachment A and summarized below:

RBAC Type	RBAC ( $\mu\text{g/m}^3$ )
Action Level (ELCR = $1 \times 10^{-6}$ )	0.12
Action Level (HI of 0.2)	0.06
Maximum Acceptable Level (ELCR = $1 \times 10^{-5}$ )	1.2
Maximum Acceptable Level (HI = 1)	0.3

An action level of  $0.06 \mu\text{g/m}^3$  and a maximum acceptable level of  $0.3 \mu\text{g/m}^3$  are the lowest values. Both are based on non-carcinogenic effects.

Massachusetts has issued several air guidance values for PCBs; including TELs, AAL, and ATCs. The basis of these values is described in the table on the following page and compared with the proposed RBACs.

<sup>1</sup> The average inhalation rate and body weight of youth between the ages of 9 and 14 is  $13.5 \text{ m}^3/\text{day}$  and  $44 \text{ kg}$ , resulting in a  $\text{m}^3/\text{kg}$  ratio of  $13.5/44 = 0.31$ . The typical values for inhalation rate and body weight of adults gives a similar ratio:  $20 \text{ m}^3/\text{day}/70 \text{ kg} = 0.29$  (U.S. EPA 1997).



Value	Air Concentration ( $\mu\text{g}/\text{m}^3$ )	Basis
Threshold effects exposure limit (TEL)	0.003	Based on non-carcinogenic (threshold) effects, using a "most appropriate occupational level" of $0.001 \text{ mg}/\text{m}^3$ (obtained from NIOSH) to which uncertainty factors were applied, adjusted to account for exposure differences between workers and children, and allowing only 20% of the acceptable exposure (MADEP 1990).
Allowable Threshold Concentration (ATC)	0.02	Five times TEL (i.e., removing 20% relative source contribution) (MADEP 1995).
Allowable Ambient Limit (AAL)	0.0005	Based on a $1 \times 10^{-6}$ ELCR, assuming continuous exposure and using an old unit risk value of $0.0022 [(\text{mg}/\text{m}^3)^{-1}]$ (MADEP 1990).
<b>Proposed Risk-based Air Concentrations</b>		
Proposed Action Level	0.06	Based on a non-cancer effects at a hazard index of 0.2; assuming exposure 8 hours per day, 250 days per year, for 25 years, using a calculated reference concentration of $0.00007 \text{ mg}/\text{m}^3$ , extrapolated from oral reference dose of $0.00002 \text{ mg}/\text{kg-dy}$ assuming a 70 kilogram adult body weight and a $20 \text{ m}^3/\text{day}$ inhalation rate.
Proposed Maximum Acceptable Level	0.3	Based on a non-cancer effects at a hazard index of 1.0; assuming exposure 8 hours per day, 250 days per year, for 25 years, using a calculated reference concentration of $0.00007 \text{ mg}/\text{m}^3$ , extrapolated from oral reference dose of $0.00002 \text{ mg}/\text{kg-dy}$ assuming a 70 kilogram adult body weight and a $20 \text{ m}^3/\text{day}$ inhalation rate.

The TEL and ATC are based on occupational exposure limits and the AAL is based on an outdated toxicity value for PCBs (which were revised in 1997), making these values unsuitable for use at the Site. In addition, all are based on continuous exposure, whereas receptors at the school will be exposed intermittently.

### References

- MADEP (1990). The Chemical Health Effects Assessment Methodology and The Method To Derive Allowable Ambient Limits. February.
- MADEP (1995). Massachusetts Allowable Threshold Concentrations (ATCs). December.
- U.S. EPA (1997). Exposure Factors Handbook, Volume I. EPA/600/P-95/002Fa, August.